



বিদ্যাসাগর বিশ্ববিদ্যালয়
VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examinations 2020

(Under CBCS Pattern)

Semester - III

Subject: PHYSICS

Paper: C6T & C6P

(Thermal Physics)

Full Marks : 60

Time : 3 Hours

Candidates are required to give their answer in their own words as far as practicable.

The figures in the margin indicate full marks.

Group - A

THEORY (Marks : 40)

Answer any *two* from the following questions :

2×20

1. Answer any *five* from the following :

5×4=20

(a) Prove that adiabatic process is steeper than the isothermal process.

(b) What is free expansion ? Is it an adiabatic process ?

(c) State the Zeroth Law of Thermodynamics ?

- (d) Write down the Maxwell's four thermodynamic relations.
- (e) What are the characteristics of a Carnot engine ?
- (f) State the principle of equipartition of energy.
- (g) In what absolute temperature all real gas behaves like an ideal gas. What do you mean by critical temperature of a gas ?
2. (a) If θ_B and θ_C are the Boyle temperature and critical temperature, establish the relation $\theta_B = 27/8\theta_C$. 7
- (b) Calculate the van-der-waals constants a and b for CO_2 taking critical temperature = $31.1^\circ C$ and critical pressure = 73 atmos $R = 82.07 \text{ cm}^3 \cdot \text{atmos K}^{-1} \cdot \text{mol}^{-1}$. 7
- (c) Define mean free path of a gas molecule. 6
3. (a) $2g$ of nitrogen becomes double in volume at constant temperature. Calculate the change in entropy, given relative molecular mass of nitrogen = 28 . 6
- (b) Derive the relation $C_p - C_v = T \left(\frac{dp}{dT} \right)_v \left(\frac{dV}{dT} \right)_p$. 7
- (c) Given $PV = RT + BP$. Prove that $C_p - C_v = R + 2P \left(\frac{dB}{dT} \right)$. 7
4. (a) How low temperature is produced by adiabatic Demagnetization ? 10
- (b) State Clausius theorem and discuss briefly the concept of entropy. Show that the entropy of n mole of an ideal gas of constant heat capacity C_v at a temperature T and Volume V is given by $S = C_v \ln T + nR \ln V + S_0$. Calculate the change in entropy when two dissimilar gases having the same temperature and pressure are allowed to diffuse. 2+2+4+2

Group - B

PRACTICAL (Marks : 20)

Answer any **one** from the following questions :

1×20

1. Determination of the Coefficient of Thermal Conductivity of bad conductor by Less-Charlton method.
 - (a) Write down the working formula explaining each term.
 - (b) Briefly explain the process of data collection.
 - (c) Draw the theoretical variation of cooling curve (θ vs t) and calculation of rate of cooling.
 - (d) What is Bedford's correction ?
2. Determination of the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.
 - (a) Write down the working formula explaining each term.
 - (b) Draw a schematic of the experimental set up.
 - (c) Briefly explain the process of data collection.
 - (d) Discuss the source of errors in this experiment.
3. To study the variation of Thermo-Emf a Thermocouple with Difference of Temperature of its Two Junctions.
 - (a) Write down the working formula explaining each term.
 - (b) Draw a schematic of the experimental set up.
 - (c) Briefly explain the process of data collection.
 - (d) Draw the theoretical variation of thermo emf with temperature.

4. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT)

- (a) Write down the working formula explaining each term.
- (b) Draw a schematic of the experimental set up.
- (c) Briefly explain the process of data collection.
- (d) Explain the calculation of maximum proportional error.

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